# 860 DSPi

**Multifunction Digital Analyzer**

- DSP Technology Allows for Quick, Accurate Measurements
- Versatile Capabilities Range from Triple Play Signal Analysis for Installations to a Wide Range of Plant Maintenance Tests
- Adaptable Platform Grows to Meet the Needs of Technicians at Every Tier
- Easy-to-Read Display and Simple Interface Get New Users Up and Running Quickly
- Integrates with OSS and Workforce Management Systems for Improved Productivity

## Change with the times without changing meters.

*Fast, accurate measurements with a versatile meter you can update or upgrade anytime, usually with a simple firmware download.*

**Efficient, versatile, & comprehensive**
The 860 DSPi™ quickly and efficiently performs all of the critical transmission and signal quality tests needed to install, troubleshoot and maintain analog, digital, HSD, and VoIP services.

The analyzer can be configured with features that make day-to-day maintenance more efficient and improve troubleshooting speed for plant technicians. Powerful options add high-resolution spectrum analysis, QAM and QPSK constellation displays and a wide range of return path tests, all without impacting size or weight.

Fast boot-up and quick test mode transition improve technician productivity. And thanks to the efficiency of digital signal processing technology, the battery life of the 860 DSPi can be up to five times longer than that of other instruments.

The 860 DSPi works with Guardian System II™ reverse path monitoring equipment, and can be equipped with options to provide an extensive range of reverse path test capabilities. With the SpeedSweep™ FS-1 option, the 860 DSPi receives forward sweep from the 8300 FST™; with the SR-1 option, it also generates reverse sweep to be received by the 9581 SST™ and displayed on the 860's easy-to-read LCD display.

**Adaptable for future needs**
The 860 DSPi is the first portable instrument platform capable of evolving over time to meet emerging measurement and data communication requirements. It can be upgraded as new services are introduced, usually through Trilithic's free update website.

The use of flexible, cutting-edge digital signal processing (DSP) technology means that applications that were not even available when the analyzer was originally purchased can be added later, often by simply downloading firmware. This ability to easily keep the 860 DSPi as up-to-date as currently shipped analyzers gives it a longer life cycle and significantly reduces the lifetime cost of ownership.

**Fast boot-up for quick measurements**
With the 860 DSPi ready to perform measurements within a few seconds after turn-on, technicians can perform tests quickly. The 860 also provides test data to the operator up to 10 times faster than other analyzers, so problem sources can be identified faster, shortening trouble calls.

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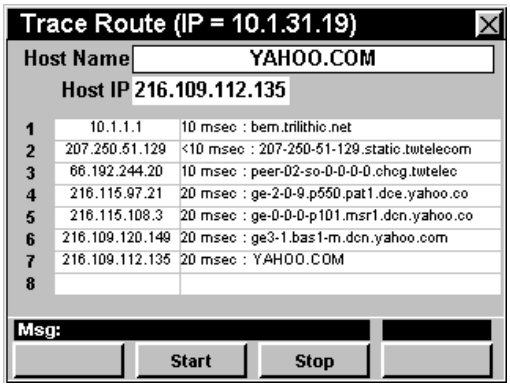
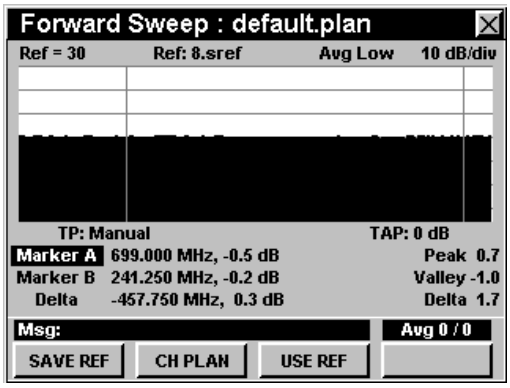
**Multifunction Digital Analyzer**

### Complete testing capabilities

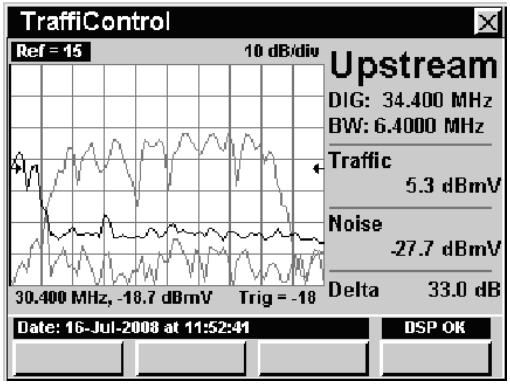
The 860 DSPi provides extremely versatile measurement capabilities, addressing the needs of technicians and engineers for everything from installation signal analysis to a wide range of plant maintenance tests.


Trace Route (IP = 10.1.31.19)
Host Name YAHOO.COM
Host IP 216.109.112.135
1 10.1.1.1 10 msec : bem.trilithic.net
2 207.250.51.129 <10 msec : 207-250-51-129.static.twtelecom
3 66.192.244.20 10 msec : peer-02-so-0-0-0-0.chcg.twtelec
4 216.115.97.21 20 msec : ge-2-0-9.p550.pat1.dce.yahoo.co
5 216.115.108.3 20 msec : ge-0-0-0-p101.msr1.dcn.yahoo.co
6 216.109.120.149 20 msec : ge3-1.bas1-m.dcn.yahoo.com
7 216.109.112.135 20 msec : YAHOO.COM
8
Msg:
Start
Stop

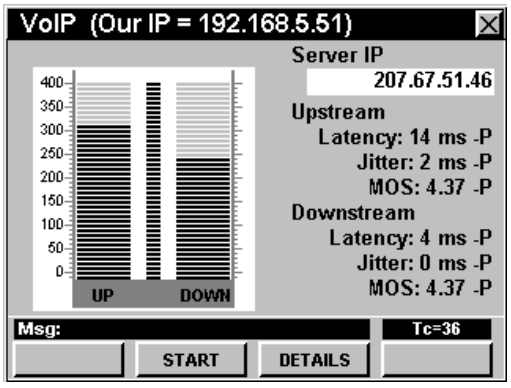
Track IP transmission paths with Trace Route™.



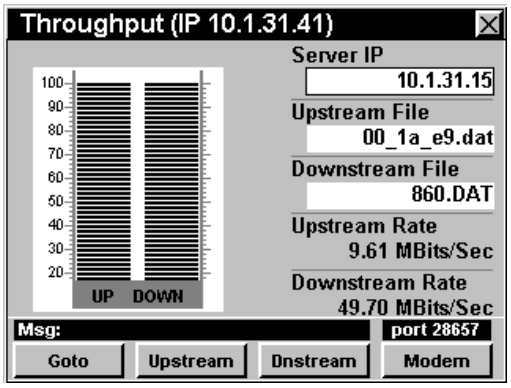

Measure system frequency response with SpeedSweep system compatibility.



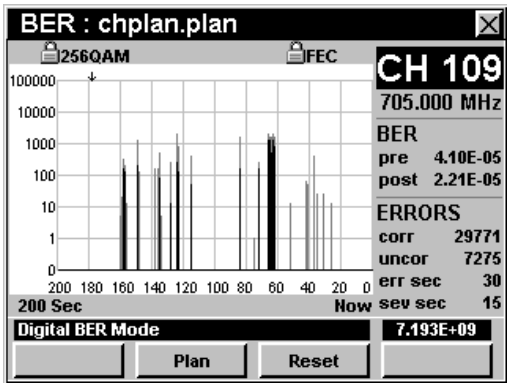

Find in-channel distortion or other interference without interrupting service with Error Vector Spectrum™ or TraffiControl™ modes.




Measure latency, jitter, packet loss, and other VoIP parameters in seconds. Analyze VoIP performance from end-to-end and from the subscriber to the CMTS. When testing end-to-end, the 860 DSPi displays separate test results for upstream and downstream paths and even calculates an MOS score for each.




Test throughput, packet loss, reverse transmit levels, MER, BER, and more.




Use the 860 DSPi's Average BER function to estimate BER up to 10 times faster than any alternative. Use the Impulse BER function to detect and count individual lost packets. BER data is displayed with values and a convenient graph that shows how pre and post BER changes over a user-settable interval. Enhanced digital video feature equips the analyzer to perform impulse BER measurements on deep interleave digital video channels and enhances constellation graphs if the 860 DSPi includes Option QA-2.

# 860 DSPi

**Multifunction Digital Analyzer**

### Designed for Convenience and Durability

- Fast boot up, fast operation.
- Simple, direct keyboard functions.
- Large, widely spaced buttons are usable with gloves.
- Single keystroke measurement functions or soft keys for simple navigation.
- Auto-test up to 16 functions, with limit comparison and pass/fail results.
- Long battery life (operate your 860 DSPi for 4 to 6 hours on a single charge, even with the display backlight turned on, without intrusive battery-saving methods).
- High resolution 5.7” backlit transflective LCD display.
- Strong, shock-resistant construction, with integral rubber boot; padded bag included.
- Lightweight, with convenient carrying straps.

### Standard Measurements

- Signal levels: one channel to full span, analog and digital; total power.
- “Mini-scans” of up to 10 selected channels (video and digital carriers).
- Forward tilt.
- Reverse spectrum scan to -40 dBmV.
- Numerical values of forward BER/MER.
- Digital power.
- Lost packet rate.
- DOCSIS modem upstream transmit level.
- DOCSIS speed, throughput.
- PC substitution.
- VoIP jitter, latency upstream, and downstream.
- Lost/discarded packets upstream, and downstream.
- Calculated MOS score, upstream, and downstream.
- Trace route.
- 64 QAM source for upstream testing.

### DOCSIS 3.0 Compatibility

The 860 DSPi with a standard DOCSIS 2.0 MODEM is capable of testing a wide range of parameters on DOCSIS 3.0 signals. The following tests can be performed on any D3 signal:

- Signal level scan
- Spectrum analysis
- QAM EVS (error vector spectrum)
- TraffiControl
- QAM level
- Constellation
- MER
- BER
- iBER – long-term BER

Additional tests can be performed on “primary” D3 signals:

- VoIP
- Cable MODEM statistics
- Ping
- Trace route
- Web browser
- High-speed throughput

The 860 DSPi is ready to perform network tests to prepare the plant for these services; perform installation tests as the services are rolled out; troubleshoot throughout the network; and perform sweep/maintenance tests before and after the services are deployed.

## OPTIONS

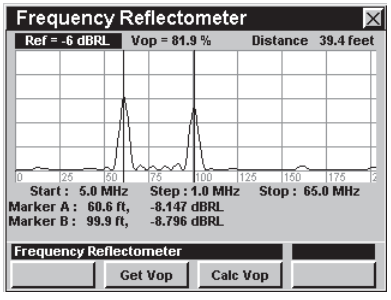
The 860 DSPi options are available on an *a la carte* basis, but the prerequisite option is the Power Pack™, which must be purchased in order for the instrument to be fitted with other DSPi options.

### PP-1 Power Pack

- Adds full 5 MHz to 1 GHz channel scan and monitoring; C/N, hum, FM deviation, depth of modulation, CSO/CTB, forward (system carrier-referenced sweep) sweep balancing, and an internet browser.
- The Power Pack is a prerequisite for all other 860 DSPi options.

### FDR Frequency Domain Refloctometer™ Option

- Measurement uses sweep analysis of a cable or drop to determine the distance to multiple opens, shorts, splitters, or faults
- Allows the 860 to identify multiple cable components in a passive home network


Frequency Reflectometer
Ref = -6 dBRL
Vop = 81.9 %
Distance 39.4 feet
0 25 50 75 100 125 150 175
Start : 5.0 MHz
Step : 1.0 MHz
Stop : 65.0 MHz
Marker A : 60.6 ft, -8.147 dBRL
Marker B : 99.9 ft, -8.796 dBRL
Frequency Reflectometer
Get Vop
Calc Vop

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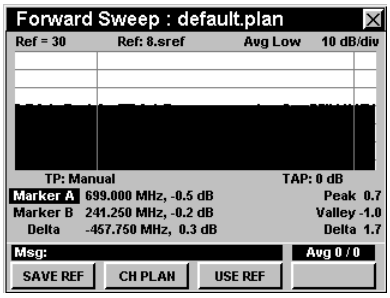
**Multifunction Digital Analyzer**

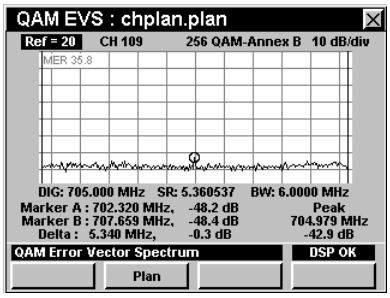
## FS-1 Forward Sweep Option

- Enables a forward sweep display
- Compatible with the SpeedSweep System for forward sweep balancing and troubleshooting



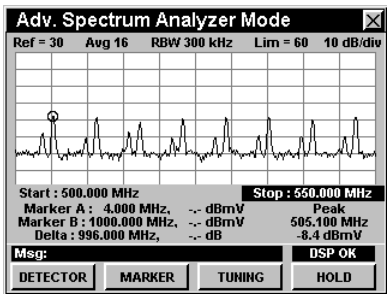

## QA-2 QAM Option

- Constellation and equalizer display capability.
- Error Vector Spectrum mode – enables viewing in-channel spectrum characteristics.



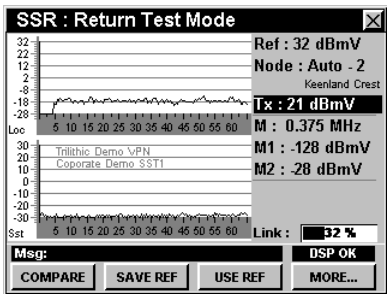

## SA-1 Spectrum Analysis

- Full-featured DSP alternative to analog analyzers
- Adds multiple resolution bandwidth settings from 10 kHz to 3 MHz
- Adds zero span mode



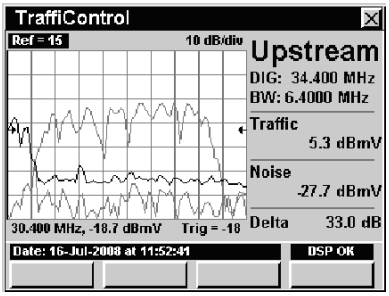

## SR-1 Return Sweep Receiver

- Compatible with the 9581 SST
- Useful for return path balancing and troubleshooting



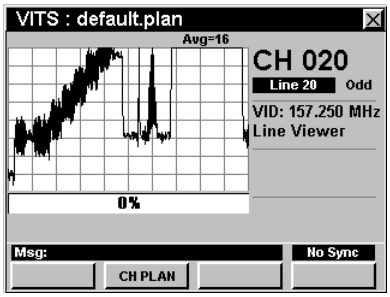

## TC-1 TraffiControl Option

- Allows viewing of in-channel spectrum characteristics for upstream data channels



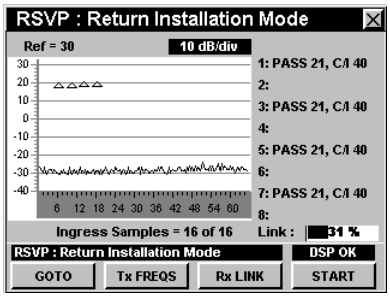

## VITS Vertical Interval Test Signal™ Option

- Enables testing of baseband video parameters on active analog channels with active VITS



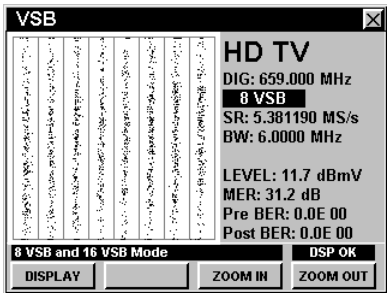

## VP-1

- Adds RSVP²™ Installer's Return Tester functions to the 860
- Expands the 860 to allow testing of eight frequencies at once
- Compatible with 9581 SST




## VSB Vestigial Sideband™ Modulation Option

- Feature enables analysis of off-air digital video transmissions, including levels, constellation, equalizer taps, and BER



# 860 DSPi

**Multifunction Digital Analyzer**

## RELATED PRODUCTS

**Improved productivity with workforce management**

The 860 DSPi integrates with Trilithic's TDM™ test data management server package to enable managers and others to configure and manage analyzer inventory, store measurement data, generate reports and create custom database queries.

The integrated system lets cable operators track tech performance, control the quality of installations and – via a connection to the company billing system – even develop and monitor productivity improvement metrics.

### 860 DSP Analyzer: A Cost-Effective Alternative.

*Part of the 860 family, the 860 DSP is for applications that do not require a modem-equipped meter. It performs physical measurements only. For technicians not required to maintain DOCSIS services, the 860 DSP is a cost-effective alternative.*

**I-Stop™ Ingress Test Probe** (P/N 2010838001)

The I-Stop probe contains a patented circuit that, when used with a reverse path monitoring system, confirms the location of an ingress source down to the nearest tap. Eliminates the need to remove reverse pads, tap bodies, or diplexers for troubleshooting. Pressing the button on the side of the probe causes a 4 to 6 dB reduction in the ingress seen by the return monitoring system, confirming this leg of the distribution system contains the ingress source. The I-Stop probe has little or no visible effect on forward video signals.

**I/O-15 Coaxial Precision Test Cable** (P/N 2071527048)

The I/O-15 is a precision test cable suitable for field and head end test equipment. The small-diameter (0.16") allows the cable to be conveniently stored in a pocket or in the instrument's bag. The I/O-15 exhibits a loss of only 0.7 dB at 1 GHz, and lab quality materials and machined female F-type connectors insure long service life. A lab-quality push-on adaptor is included with each cable.

**TLB-60 Return Measurements Filter** (P/N 2011066000)

The TLB-60 60 MHz low-pass filter is useful when searching for common path distortions or other low-level disturbances, eliminating overload from forward channels present at the test port. The TLB-60 can extend the measurement range of a spectrum analyzer or field signal analyzer by as much as 20 dB.

**CC-23 Utility Bag** (P/N 2131221000)

The CC-23 is a protective carrying case large enough to conveniently hold a technician's instrument kit, including the 860 DSPi, a Searcher Plus-series leakage detector, test cables, probes, and more. Includes one I/0-15 precision test cable.

# 860 DSPi

**Multifunction Digital Analyzer**

## SPECIFICATIONS

| | |
|---|---|
| **Frequency Range** | 5 MHz to 1 GHz |

**Level Measurement**

| | |
|---|---|
| **Range** | -40 to +50 dBmV |
| **Resolution** | 0.1 dB |
| **Accuracy** | @ 25˚ C (77˚ F): ±0.75 dB<br>Over temp -18˚ to +50˚ C (0˚ to 122˚ F): ± 2.0 dB (analog), ± 2.5 dB (digital) |

**Carrier-to-Noise** (In-service, non-scrambled standard channels only)

| | |
|---|---|
| **Minimum Input Level for Full Range** | +10 dBmV |
| **Dynamic Range** | 50 dB |
| **Resolution** | <0.5 dB |

**Hum** (In-service, non-scrambled standard channels only)

| | |
|---|---|
| **Minimum Input Level** | 0 dBmV |
| **Range** | 0 to 5% |
| **Resolution** | 0.1% |
| **Accuracy** | ±0.5% |

**Depth of Modulation** (In-service, non-scrambled standard channels only)

| | |
|---|---|
| **Range** | 50 to 100% |
| **Resolution** | 0.5% |
| **Audio Dimension** | FM carriers |

**Tilt**

| | |
|---|---|
| **Max Number of Carriers** | 10 |
| **High/Low Delta Resolution** | 0.1 dB |
| **Scan** | Video, audio, pilot, and digital carriers; includes total power measurement |

**Spectrum Mode**

| | |
|---|---|
| **Display Spans** | User-selectable in 10 kHz steps |
| **Display Scale** | 1, 2, 5, or 10 dB/division |
| **Display Range** | 7 vertical lines |
| **Sweep Rate (78 Channels)** | ~500 ms |
| **Detection and Dwell** | Selectable detector modes (Narrow or Wide) and dwell time |
| **Spurious Free Dynamic Range** | 60 dB @ 25˚ C (77˚ F) (+50 dBmV) |
| **Sensitivity** | -40 dBmV (4 MHz to 1 GHz) |

**Zero Span Mode**

| | |
|---|---|
| **Video Bandwidth** | Digital averaging |
| **Resolution Bandwidth** | 10, 30, 100, and 300 KHz; 1, 3 MHz |
| **Pulse Measurement Accuracy** | Nominal level in <7ms, ±2 dB from nominal in 4ms (300 kHz RBW) |
| **Sweep Times** | 50 µs to 20 sec in 1, 2, 5 settings |

**Intermodulation Distortion** (CSO/CTB)

| | |
|---|---|
| **Range** | ≥60 dB |
| **Resolution** | 0.1 dB |

# 860 DSPi

**Multifunction Digital Analyzer**

**QAM Measurements**

| | |
|---|---|
| **Modulation Types** | ITU J.83 annex A, B, C; QPSK, 16, 32, 64, 128, and 256 QAM (at symbol rates from 2 MSPS to 6.9 MSPS) |
| **Measurable Input (Lock) Range** | **64 QAM:** -20 to +50 dBmV (typical)<br>**256 QAM:** -15 to +50 dBmV (typical) |
| **Frequency Tuning** | 5 MHz to 1 GHz |
| **BER; 64 and 256 on all modulations** | $10^{-4}$ to $10^{-10}$ |
| **MER** | **64 and 256 QAM, 6 MHz channel bandwidth:**<br>Range: 21 to 38 dB<br>Accuracy (typical): ±1.5 dB<br>**64 and 256 QAM, 8 MHz channel bandwidth:**<br>Range: 21 to 35 dB<br>Accuracy (typical): ±2.0 dB |
| **EVM** | **64 QAM, 6 or 8 MHz channel**<br>Range: 1.1% to 8.1%<br>Accuracy: ±0.5% (1.1 to 2.0%)<br>±1.0% (2.1 to 4.2%)<br>±1.6% (4.3 to 8.1%)<br>**256 QAM, 6 or 8 MHz channel**<br>Range: 1.1% to 5.3%<br>Accuracy: ±0.5% (1.1 to 2.0%)<br>±0.8% (2.1 to 4.2%) |

**QAM Level Measurement**

| | |
|---|---|
| **Signal Types** | QPSK; QAM (16, 32, 64, 128, & 256) |
| **Range** | -40 to +50 dBmV |
| **Accuracy @ 25˚ C** | ±1.25 dB |

**Power Source**

| | |
|---|---|
| **Charging Time** | 4 hours |
| **Operating Time, Continuous Use** | 4 to 6 hours |

**Physical**

| | |
|---|---|
| **Weight** | 5.85 lbs (2650 g) |
| **Operating Temperature Range** | -18˚ to +50˚ C (0˚ to 122˚ F) |

## INCLUDES THE FOLLOWING:

5 MHz to 1 GHz analyzer (customer-specified options)
**P/N 201097100U**

Protective carrying case

Shoulder strap

Universal charger, 90 to 220 VAC, U.S. plug

User's manual

## OPTIONAL ACCESSORIES:

External battery charger
**P/N 2010986000**

Vehicle power adaptor (CL-5)
**P/N 2070704002**

Precision test cable (I/O-15)
**P/N 2071527048**

Protective display shields
**P/N 2230521001**

I-Stop probe
**P/N 2010838001**

TLB-60 filter
**P/N 20110666000**

Utility bag (CC-23)
**P/N 2131221000**

VoIP RTP™ server software
**P/N 0930110000**

WorkBench™ software
**P/N 0930083000**

ACTS™ software
**P/N 0930144000**

TDM software
**P/N 2011092100**

## RELATED ITEMS:

8300 FST Forward Sweep Transmitter
**P/N 2011072001**